

## Title (en)

QUANTUM COMMUNICATIONS SYSTEM HAVING PULSES DIVIDED INTO TIME BINS AND ASSOCIATE METHODS

## Title (de)

QUANTENKOMMUNIKATIONSSYSTEM MIT IN ZEITFÄCHERN UNTERTEILTEN IMPULSEN UND ZUGEHÖRIGE VERFAHREN

## Title (fr)

SYSTÈME DE COMMUNICATION QUANTIQUE AYANT DES IMPULSIONS DIVISÉES EN SEGMENTS TEMPORELS ET PROCÉDÉS ASSOCIÉS

## Publication

**EP 4178152 A1 20230510 (EN)**

## Application

**EP 22196441 A 20220920**

## Priority

US 202117453657 A 20211105

## Abstract (en)

A quantum communications system may include a transmitter node, a receiver node, and a quantum communications channel coupling the transmitter node and receiver node. The transmitter node may include a pulse transmitter and a pulse divider downstream therefrom. The pulse divider may be configured to divide each pulse having a plurality of X photons into a plurality of Y time bins with  $Y > X$ . The receiver node may include a pulse recombiner and a pulse receiver downstream from the pulse recombiner.

## IPC 8 full level

**H04L 9/08** (2006.01); **H04B 10/70** (2013.01)

## CPC (source: EP US)

**H04B 10/524** (2013.01 - US); **H04B 10/60** (2013.01 - US); **H04B 10/70** (2013.01 - US); **H04L 9/0852** (2013.01 - EP US); **H04B 10/70** (2013.01 - EP)

## Citation (applicant)

- US 17179562 A 19620214
- US 202117179600 A 20210219
- US 201916583346 A 20190926
- US 8456736 B2 20130604 - WISE FRANK W [US], et al
- US 10109976 B2 20181023 - WISE FRANK W [US], et al
- US 10374376 B2 20190806 - LIU ZHIWEN [US], et al
- ZHOU ET AL.: "Divided-Pulse Amplification of Ultrashort Pulses", OPTICS LETTERS, vol. 32, no. 7, 2007, pages 871 - 873, XP001540441, DOI: 10.1364/OL.32.000871
- ZHANG ET AL.: "Divided Pulse Soliton Self-Frequency Shift: A Multi-Color, Dual-Polarization, Power-Scalable, Broadly Tunable Optical Source", OPTICS LETTERS, vol. 42, no. 3, 2017, pages 502 - 505, XP055939173, DOI: 10.1364/OL.42.000502
- LAMB ET AL.: "Divided-Pulse Lasers", OPTICS LETTERS, vol. 33, no. 9, 2014, pages 2775 - 2777, XP001589650, DOI: 10.1364/OL.39.002775

## Citation (search report)

- [X] US 2010142034 A1 20100610 - WISE FRANK W [US], et al
- [A] EP 3337063 A1 20180620 - ID QUANTIQUE S A [CH]
- [XY] JACHURA MICHAL ET AL.: "Photon-efficient quantum key distribution using multiqubit time-bin encoding", SPIE SMART STRUCTURES AND MATERIALS + NONDESTRUCTIVE EVALUATION AND HEALTH MONITORING, 2005, SAN DIEGO, CALIFORNIA, UNITED STATES, SPIE, US, vol. 11852, 11 June 2021 (2021-06-11), pages 118525J - 118525J, XP060144877, ISSN: 0277-786X, ISBN: 978-1-5106-4548-6, DOI: 10.1117/12.2599962
- [X] ALI ANWAR ET AL.: "Entangled Photon-Pair Sources based on three-wave mixing in bulk crystals", ARXIV.ORG, CORNELL UNIVERSITY LIBRARY, 201 OLIN LIBRARY CORNELL UNIVERSITY ITHACA, NY 14853, 5 May 2021 (2021-05-05), XP081950460, DOI: 10.1063/5.0023103
- [Y] P. SIBSON ET AL.: "Chip-based quantum key distribution", NATURE COMMUNICATIONS, vol. 8, no. 1, 9 February 2017 (2017-02-09), XP055653737, DOI: 10.1038/ncomms13984
- [Y] KYO INOUE; HIROKI TAKESUE; TOSHIMORI HONJO, SPIE, PO BOX 10 BELLINGHAM WA 98227-0010 USA, 2009, XP040493712
- [T] "Quantum Key Distribution (QKD): Component characterization: characterizing optical components for QKD systems", GROUP SPECIFICATION, EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI), 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS ; FRANCE, vol. QKD, no. V1.1.1, 1 May 2016 (2016-05-01), XP014275055

## Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

## Designated extension state (EPC)

BA ME

## Designated validation state (EPC)

KH MA MD TN

## DOCDB simple family (publication)

**US 11451308 B1 20220920**; EP 4178152 A1 20230510

## DOCDB simple family (application)

**US 202117453657 A 20211105**; EP 22196441 A 20220920